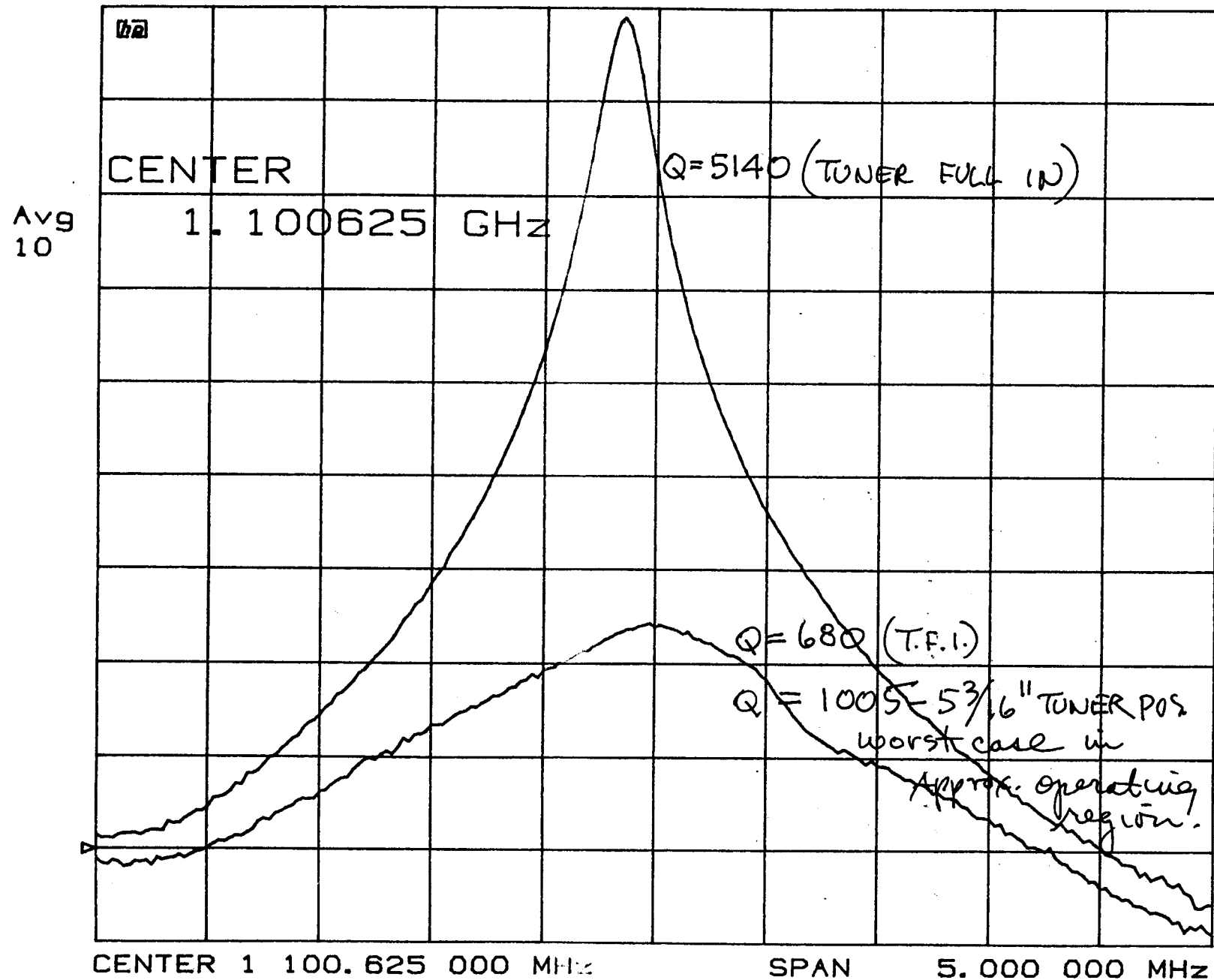


CH1 TRN 10g MAG 3 dB/ REF -65 dB



3/26/98

All probes installed and terminated

Cavity temp - ambient

Cavity vac -  $N_2$

Input loop installed 3:1 & connected to test sys. eimac amp.

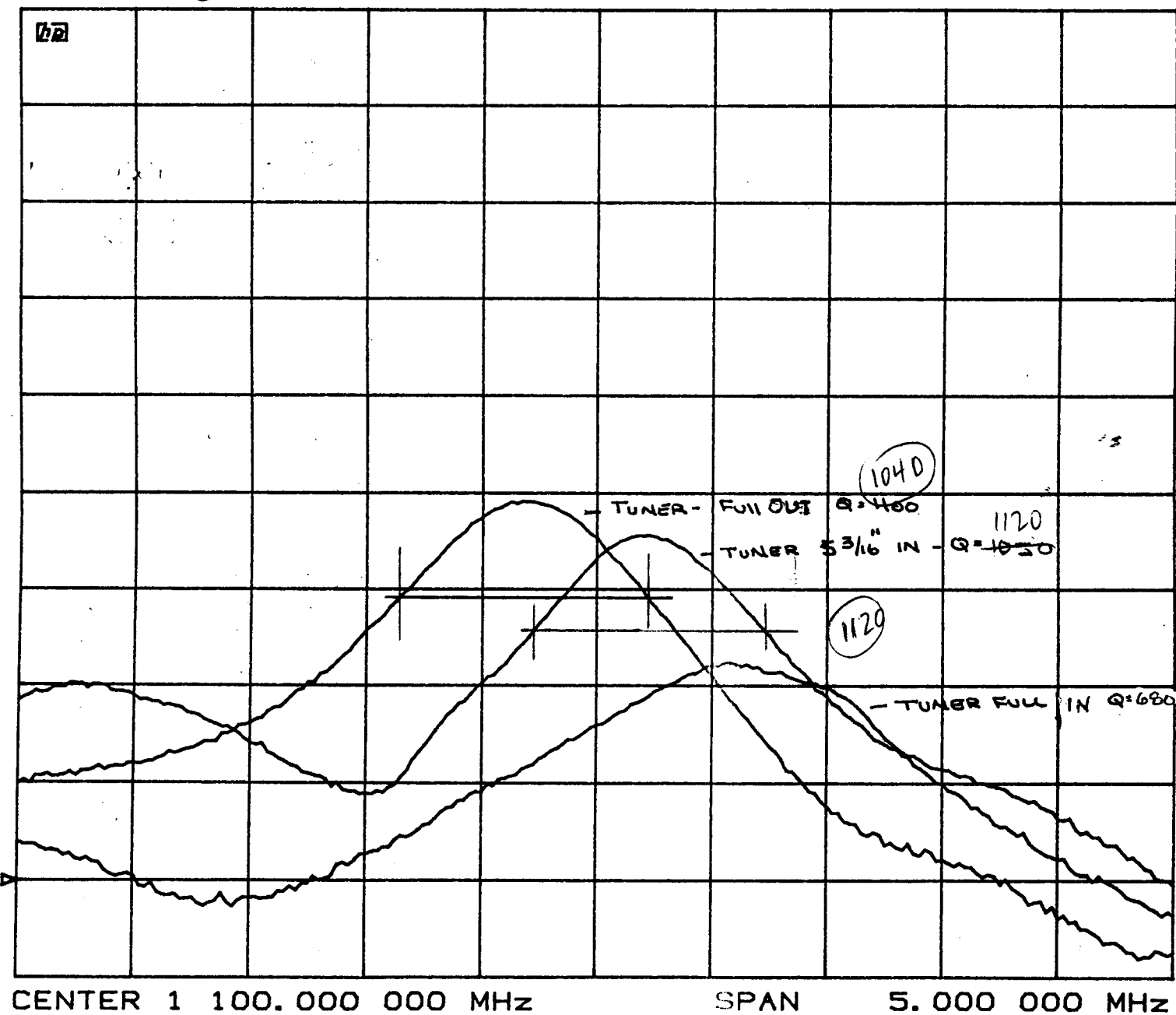
Tuner position - full IN

Sweep = transmission measurement exciting gap w/ probe  
showing effect of terminated S probe #

between G & F3

CH1 TRN 10g MAG 3 dB/ REF -65 dB

Avg  
10



3/28/98

All probes installed & terminated - 3 probe installed in port  
between G & F3

Car Temp = ambient

Car vac - N<sub>2</sub>

Input loop installed 3:1 & connected to test system eimac amp

Sweep = 1100 MHz mode w/ 1 probe installed with Tuner at

IN STOP / OUT STOP + 5<sup>3</sup>/16 (worst case)

"

,

MT: Doe Trip No. 9700516  
PM: Doe Trip No. 9700512  
JK: Doe Trip No. 9700519

36-38. The lower readings were closer to the EB weld regions. Eight points around the perimeter of the front cover flange were tested and the hardness varied between 36 - 38.

#### Frequency Sensitivity

To resolve the frequency sensitivity of the front cover - center electrode gap, the front cover was taken off and the seal removed. The cover was then replaced and a series of shims were systematically installed to vary the gap between cover and electrode. The frequency was measured at each gap distance.

	<u>Shim(mm)</u>	<u>D(mm)</u>	<u>Freq. (MHz)</u>	<u><math>\Delta f</math> (Khz)</u>	
Start	0	2.4	51.8050	---	D = reference gap
	3	3	51.8437	38.7	
	3.5	3.5	51.8875	43.8	
	4.0	4.0	51.9380	50.5	
	4.5	4.5	51.9865	48.5	
	5.0	5.0	52.0316	45.1	

Sensitivity = 2.2 Khz / mil or 86.6 Khz / mm.

#### Q measurement

To measure unloaded Q of the cavity, the drive loop was left in an open circuit condition and the network analyzer was connected to a monitor loop. The Q measured 16000.

#### Some rough measurements on the cavity

The total length of the cavity, diameter, and the gap spacing were measured with a tape measure and conform with the print to the accuracy of the measurement. Exact measurements will be made by ACCEL to confirm exact dimensions. Five (5) mm of extra material was left on the inside of the front cover for final frequency adjustments. This accounts for 433 Khz of error. An extra 3.5 mm is available on the front cover without jeopardizing the strength and integrity of the cover and would increase the nominal frequency to 52.56 MHz - still low by 325 Khz.

#### Superfish Run - Feb. 28, 1997

The original Superfish program resulted in a frequency of 52.847 MHz, which agreed with the design frequency. A new version just downloaded from Los Alamos N.L. resulted in a frequency of 52.74 MHz. Running the program again using a real fine mesh resulted in a frequency of 52.64 MHz. Extra material left on the cover would more than compensate for this error.

The large frequency error that is measured does not correlate with any known parameters and a solution has been agreed upon between BNL and ACCEL to bring the cavity back on

MT: Doe Trip No. ~~9700516~~  
PM: Doe Trip No. ~~9700512~~  
JK: Doe Trip No. ~~970051A~~

frequency. A forge-hardened copper ring, approximately 12 mm thick, will be EB welded to the front cover and machined to the proper dimension, enlarging the front cover-to-electrode gap.

**Itinerary:**

February 17, 1997	Depart New York
February 18, 1997	Arrive Dusseldorf, drive to Bergisch-Gladbach
February 19, 1997	Business with ACCEL
February 20, 1997	Business with ACCEL
February 21, 1997	Depart Dusseldorf, Arrive London
February 22, 23 1997	Weekend stayover
February 23, 1997	Depart London - Arrive New York

**Persons Contacted:**

Udo Klein - Managing Director (ACCEL)  
Micheal Peiniger - Director (ACCEL)  
Hans Peter Vogel - Project Engineer (ACCEL)  
Several technicians and machinists pertinent to project.

**Literature Acquired:**

Various data that is enclosed in the report.

MT: Doe Trip No. ~~9700516~~  
PM: Doe Trip No. ~~9700512~~  
JK: Doe Trip No. ~~9700519~~

The frequency change is small compared to previously known deviations of 2 KHz / mil. This is probably due to the cover plate bowing outward as the bolts are tightened causing pivoting on the Helicoflex seal before its inner spring ring lays over. Further torquing of the bolts substantiate this. This has been previously experienced with cavity work at the NSLS.

At this point, it was decided to install a 'slug' into one of the large ports to measure the effect of the additional ports on frequency.

With the slug edge flush with the inner surface of the cavity, the frequency increased from 51.9770 MHz to 51.992 MHz ( $\Delta f = 15$  KHz).

With the slug penetrating into the cavity 1 cm, the  $\Delta f$  was an additional 9 KHz. This is a small percentage of the total frequency error.

Remove slug and seal off port.

Evacuate cavity at this point.  $\Delta f = 108$  KHz at  $10^{-2}$  mbar. Freq. = 51.869 MHz.

<u>Gap (mm)</u>	<u>Freq.(MHz)</u>	<u><math>\Delta</math> Freq.</u>
3.6	51.869	108 KHz (vacuum)
3.4	51.850	19 KHz
3.2	51.826	24 KHz

Checked correlation between HP network analyzer and HP spectrum analyzer  $\Rightarrow$  2 KHz.

#### Vacuum flanges leak test

At this point, the cavity was only cleaned with acetone and alcohol. No chemical cleaning had been done.

Install vacuum leak check equipment and with vacuum at  $2 \times 10^{-3}$ ; start the leak check. The small flange clamps were tightened with a torque wrench to 20 newtons and the large flange clamps to 30 newtons.

Found 2 leaks in the NSLS supplied type N connectors and sealed with gum. All Helicoflex seals and surfaces appeared tight to the helium leak check.

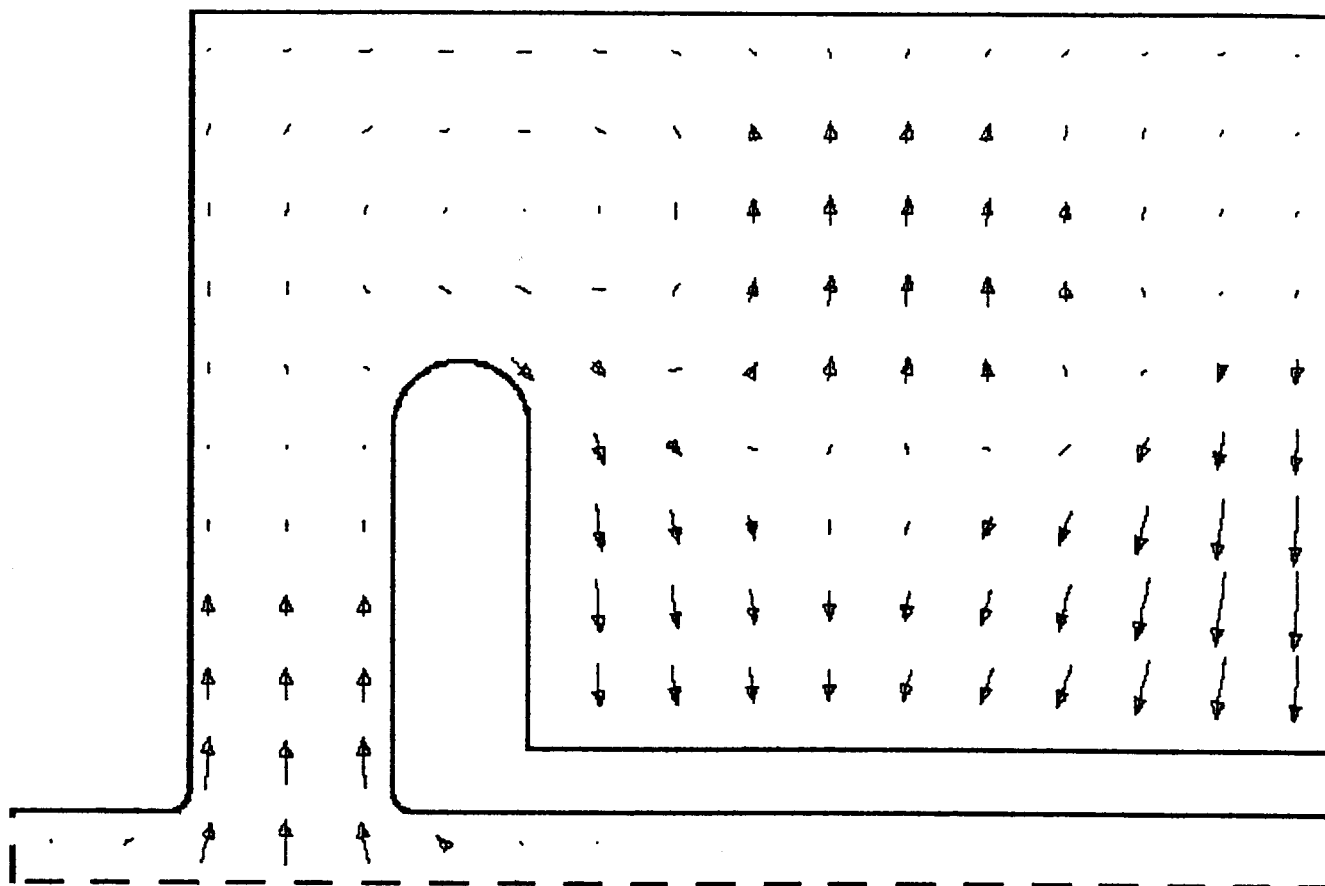
#### Hardness Test

Accel brought in an independent company to test the hardness of the copper. It was done with a portable Brunell hardness tester which was first calibrated on known calibrated hardness test blocks.

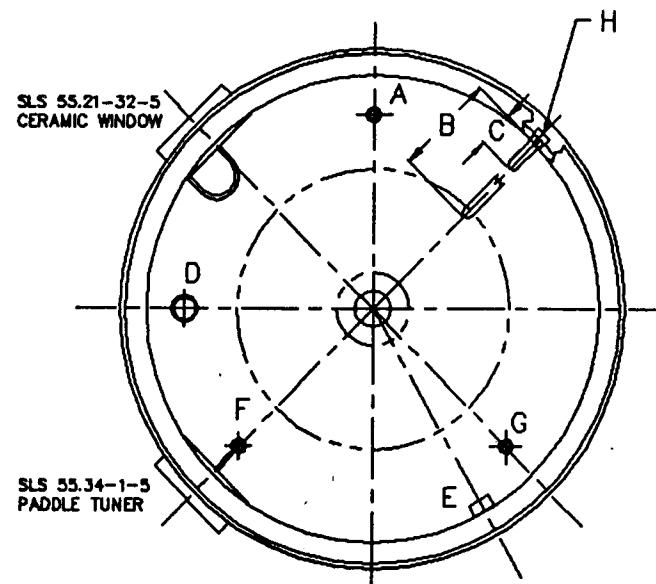
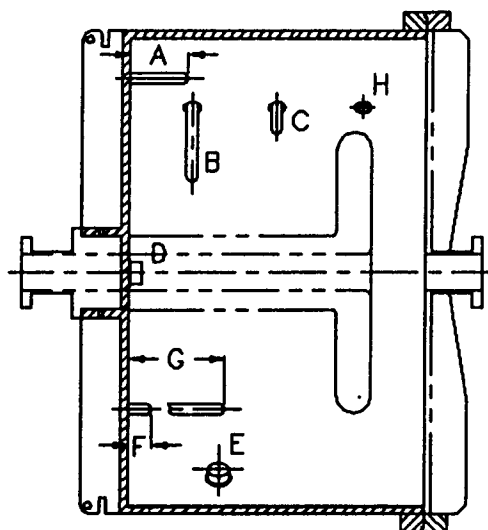
Two points in the vicinity of each flange was tested with the hardness varying between Brunell

text: unmel-vuv 52mhz cavity  
plot: h-field at phi=pi/12 (mrot)

id: jrowe 12-jan80 13:23:03 mode: 1-ee-9 f/mhz= 739.50 frow= 19 f/fc= 0.3







ANTENNA ASSEMBLY  
FOR X-RAY RING RF CAVITY 3

DIMS ARE IN MM [INCHES]

RF DWG NO.			ALTERNATE RF ANTENNA BODY WITH INSULATOR	
I.D. LETTER	P-LENGTH	ANTENNA NO.	DWG NO.	LENGTH
A	127 [5.000]	SLS 55.16-1-4	SLS 55.1-37-4	180.3 [7.098]
B	219 [8.622]	SLS 55.17-1-4	SLS 55.1-37-4	272.3 [10.720]
C	76 [2.992]	SLS 55.16-1-4	SLS 55.1-37-4	129.3 [5.091]
D	MINI LOOP	SLS 55.35-1-3	*****	*****
E	MINI LOOP	SLS 55.35-1-3	*****	*****
F *	51 [2.008]	SLS 55.15-1-4	SLS 55.1-37-4 @	104.3 [4.108]
G	210 [8.268]	SLS 55.16-1-4	SLS 55.1-37-4	263.3 [10.366]
H	PIN PROBE	PIN PROBE	*****	*****

\* EXTERNAL COOLING ONLY

● NOT A DIRECT REPLACEMENT FOR SLS 55.15-1-4  
REQUIRES A WATER COOLED RESISTOR

\*\* PROTRUSION LENGTH

? 1/2 λ short

(UNCOOLED)

NOTE:

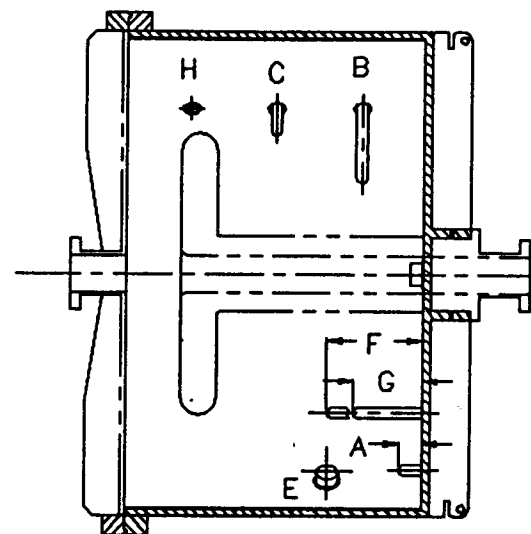
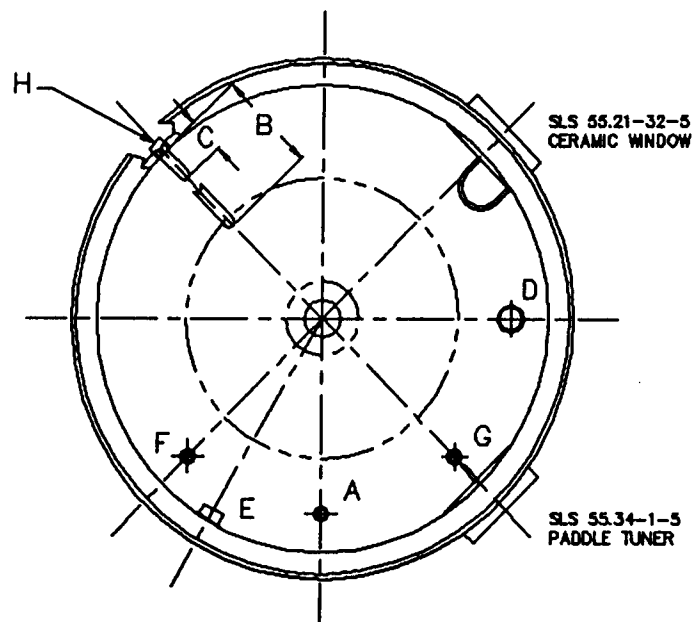
1. SEE SLS 55.6-72-3 AND SLS 55.1-38-3  
FOR ADDITIONAL INFORMATION

C	REVISED	N.G.		
B	REVISED AND REDRAWN	N.G.	1/1/70	
REV	DESCRIPTION	BY DATE	CHK APP	

SLS 55.1		SLS 55.1-1-8	-
NO. REQ.	ACCT NO.	LR NO.	ORDER NO.
DEC. ± NOTED ANG. ± 0.5°	MAX. =	MIN. =	
TOLERANCE	BREAK SHARP EDGES		
INTERPRET DRAWING PER ANSI Y14.5			
1-4-90	-	1=8	
DATE	MATERIAL	SCALE	WEIGHT
H. CUCULIELMIND			
DRAWN BY	CHECKED BY	ENG APP	SUPV APP
BROOKHAVEN NATIONAL LABORATORY			
ASSOCIATED UNIVERSITIES, INC.			
UPTON, N.Y. 11973			
NSLS X-RAY RF SYSTEM			
CAVITY 3 SYSTEM 1			
ANTENNA SIZE AND LOCATION			
SLS 55.1-35-3			C
DRAWING NUMBER			REV.

ACAD NO. 55-01/5501035C 1

SLS 55.1-35-3



ANTENNA ASSEMBLY  
FOR X-RAY RING RF CAVITY 4

DIMS ARE IN MM [INCHES]

RF DWG NO.			ALTERNATE RF ANTENNA BODY WITH INSULATOR	
I.D. LETTER	P-LENGTH	ANTENNA NO.	DWG NO.	LENGTH
A *	51 [2.008]	SLS 55.15-1-4	SLS 55.1-37-4 *	104.3 [4.106]
B	222 [8.740]	SLS 55.17-1-4	SLS 55.1-37-4	275.3 [10.838]
C	78 [2.992]	SLS 55.18-1-4	SLS 55.1-37-4	129.3 [5.091]
D	MINI LOOP	SLS 55.35-1-3	*****	*****
E	MINI LOOP	SLS 55.35-1-3	*****	*****
F	210 [8.268]	SLS 55.18-1-4	SLS 55.1-37-4	283.3 [10.368]
G	152 [5.984]	SLS 55.18-1-4	SLS 55.1-37-4	205.3 [8.083]
H	PIN PROBE	PIN PROBE	*****	*****

- \* EXTERNAL COOLING ONLY
- NOT A DIRECT REPLACEMENT FOR SLS 55.15-1-4  
REQUIRES A WATER COOLED RESISTOR
- \*\* PROTRUSION

NOTE:  
1. SEE SLS 55.6-72-3 AND 55.1-39-3  
FOR ADDITIONAL INFORMATION

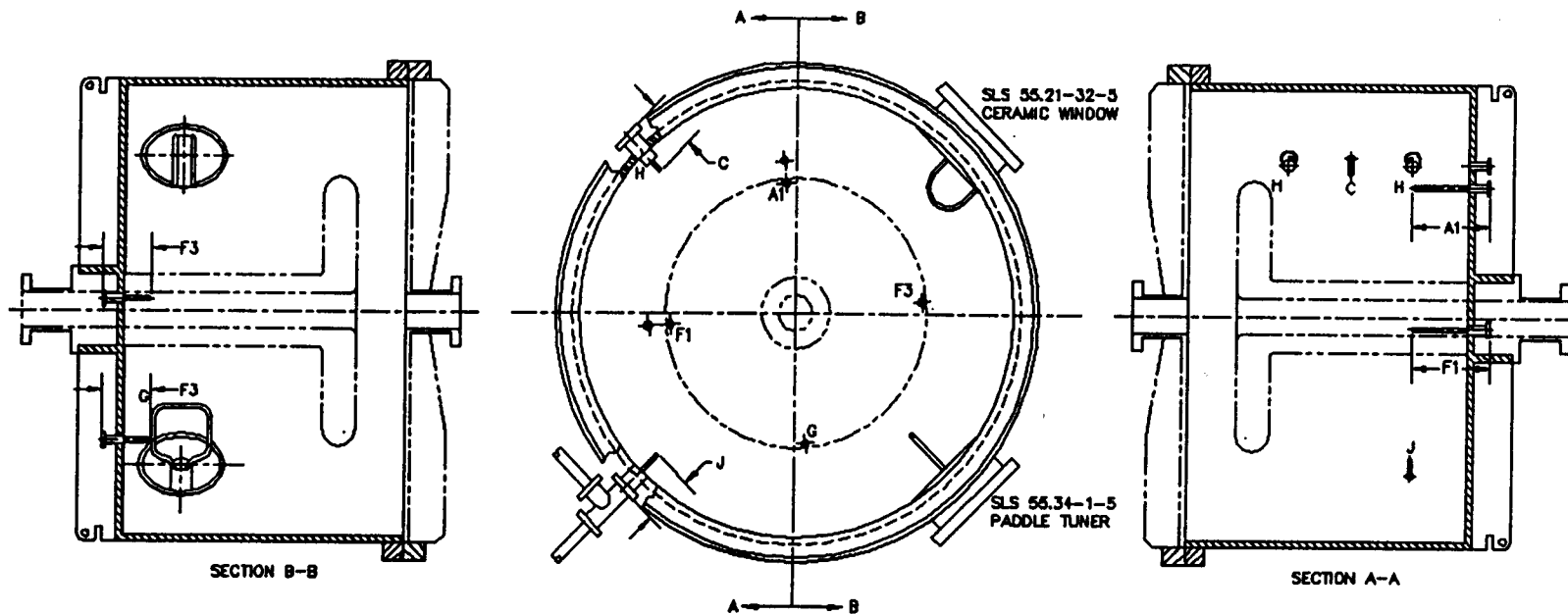
C	REVISED	N.G.		
B	REVISED AND REDRAWN	N.G.	1/11/73	
REV	DESCRIPTION	BY	DATE	CHK APP

SLS 55.1		SLS 55.1-1-6		-	
NO REQ	ACCT NO	SLR NO	ORDER NO	DEPT	JOB NUMBER
DEC. 4 NOTED ANG. ±0.5° MAX. = MIN. =		TOLERANCE		BREAK SHARP EDGES	
INTERPRET DRAWING PER ANG Y14.5		FINISH		✓	
1-4-90		1=8		SCALE	
DATE		MATERIAL		VIEW	
X. COUGHLIN		CHECKED BY		ENG APP	
DRAWN BY		CHECKED BY		ENG APP	
SLS 55.1-36-3		C		REV.	

ACAD NO. 55-01/5501036C 1

SLS 55.1-36-3

2



ANTENNA ASSEMBLY FOR X-RAY RING RF  
DIM.S ARE IN INCHES [MM]

RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
A1	*****	SLS 55.87-1-4
C	*****	SLS 55.87-1-4
F1	*****	SLS 55.87-1-4
F3	*****	SLS 55.87-1-4
G	*****	SLS 55.87-1-4
H	H-LOOP	SLS 55.35-1-3
J	*****	SLS 55.17-1-4

NOTE:  
1. SEE SLS 55.6-72-3 AND SLS-55.6-73-3  
FOR ADDITIONAL INFORMATION

COMPUTERIZED REPRODUCIBLE

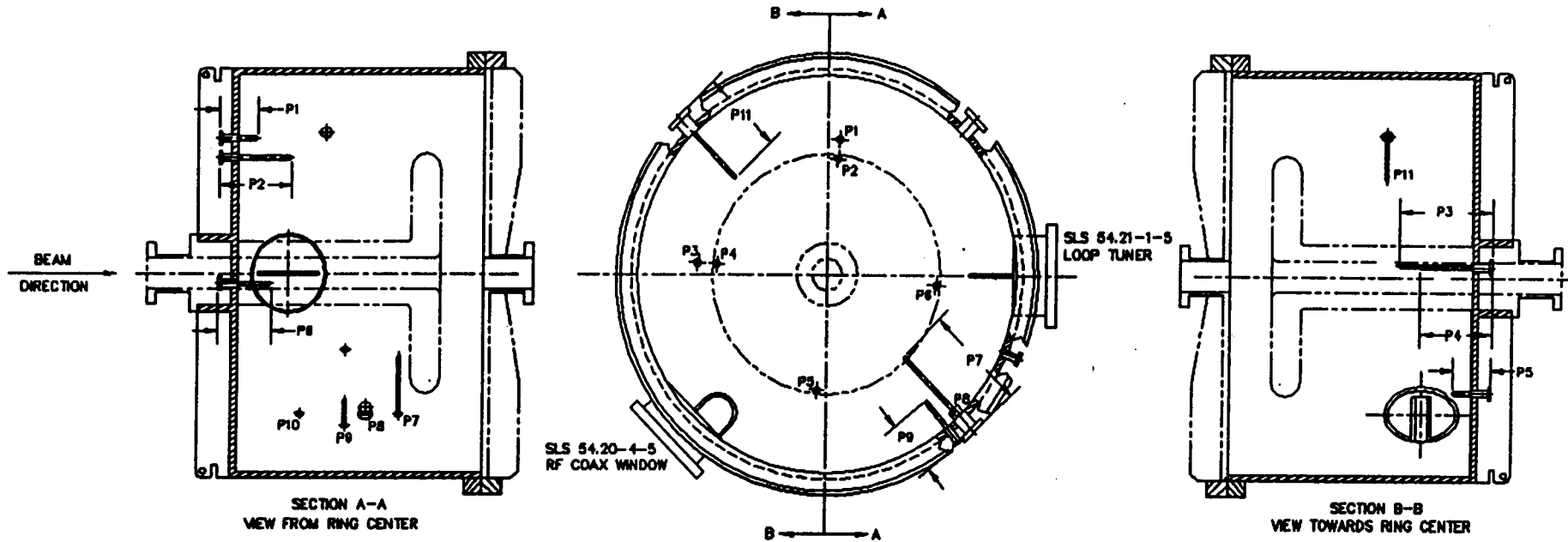
<b>NSLS</b>		A-4	SLS 55.6	SLS 55.6-31-8	1
UNLESS OTHERWISE SPECIFIED INTERPRET DIMENSIONS AS PER AND TOL. OR TOL.		GA. CH.	AND TOL.	AND TOL.	AND TOL.
DECIMAL TOLERANCES 1/2" ± 1/4" ± 1/8" ± 1/16" ± 1/32" ± 1/64" ± 1/128" ± 1/256" ± 1/512" ± 1/1024" ± 1/2048" ± 1/4096" ± 1/8192" ± 1/16384" ± 1/32768" ± 1/65536" ± 1/131072" ± 1/262144" ± 1/524288" ± 1/1048576" ± 1/2097152" ± 1/4194304" ± 1/8388608" ± 1/16777216" ± 1/33554432" ± 1/67108864" ± 1/134217728" ± 1/268435456" ± 1/536870912" ± 1/1073741824" ± 1/2147483648" ± 1/4294967296" ± 1/8589934592" ± 1/17179869184" ± 1/34359738368" ± 1/68719476736" ± 1/137438953472" ± 1/274877906944" ± 1/549755813888" ± 1/1099511627776" ± 1/2199023255552" ± 1/4398046511104" ± 1/8796093022208" ± 1/17592186044416" ± 1/35184372088832" ± 1/70368744177664" ± 1/140737488355328" ± 1/281474976710656" ± 1/562949953421312" ± 1/1125899906842624" ± 1/2251799813685248" ± 1/4503599627370496" ± 1/9007199254740992" ± 1/18014398509481984" ± 1/36028797018963968" ± 1/72057594037927936" ± 1/144115188075855872" ± 1/288230376151711744" ± 1/576460752303423488" ± 1/1152921504606846976" ± 1/2305843009213693952" ± 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RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
A1	7.2 [182.9]	SLS 55.87-1-4
C	4.41 [112.0]	SLS 55.87-1-4
F1	10.91 [277.1]	SLS 55.87-1-4
F3	4.41 [112.0]	SLS 55.87-1-4
G	8.43 [214.1]	SLS 55.87-1-4
H	H-LOOP	SLS 55.35-1-3

COMPUTERIZED REPRODUCIBLE

REV	DESCRIPTION	BY	DATE	CHK	APP
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ANTENNA ASSEMBLY FOR VUV RING RF  
DIM.S ARE IN INCHES [MM]

RF DWG NO.		
I.D. LETTER	P-LENGTH	ANTENNA NO.
P1	4.0 [101.6]	SLS 55.13-1-4
P2	7.5 [190.5]	SLS 55.13-1-4
P3	8.75 [217.7]	SLS 55.13-1-4
P4	7.5 [190.5]	SLS 55.13-1-4
P5	4.0 [101.6]	SLS 55.13-1-4
P6	5.5 [139.7]	SLS 55.13-1-4
P7	10.5 [266.7]	SLS 55.13-1-4
P8	H-LOOP	SLS 55.35-1-3
P9	5.5 [139.7]	SLS 55.13-1-4
P10	E-PROBE	*****
P11	8.5 [215.9]	SLS 55.13-1-4

NOTE:  
1. SEE SLS 55.8-72-3 AND SLS 54.8-70-3  
FOR ADDITIONAL INFORMATION

COMPUTERIZED REPRODUCIBLE

NSLS		A-4	SLS-54.2	SLS-54.2-1-6	1
UNLESS OTHERWISE SPECIFIED INTERIOR TOLERANCES ARE IN INCHES DECIMAL FRACTIONS J 1/2 J 1/4 J 1/8 J 1/16 J 1/32 J 1/64 J 1/128 J 1/256 J 1/512 J 1/1024 J 1/2048 J 1/4096 J 1/8192 J 1/16384 J 1/32768 J 1/65536 J 1/131072 J 1/262144 J 1/524288 J 1/1048576 J 1/2097152 J 1/4194304 J 1/8388608 J 1/16777216 J 1/33554432 J 1/67108864 J 1/134217728 J 1/268435456 J 1/536870912 J 1/1073741824 J 1/2147483648 J 1/4294967296 J 1/8589934592 J 1/17179869184 J 1/34359738368 J 1/68719476736 J 1/137438953472 J 1/274877906944 J 1/549755813888 J 1/1099511627776 J 1/2199023255552 J 1/4398046511104 J 1/8796093022208 J 1/17592186044416 J 1/35184372088832 J 1/70368744177664 J 1/140737488355328 J 1/281474976710656 J 1/562949953421312 J 1/1125899906842624 J 1/2251799813685248 J 1/4503599627370496 J 1/9007199254740992 J 1/18014398509481984 J 1/36028797018963968 J 1/72057594037927936 J 1/144115188075855872 J 1/288230376151711744 J 1/576460752303423488 J 1/1152921504606846976 J 1/2305843009213693952 J 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